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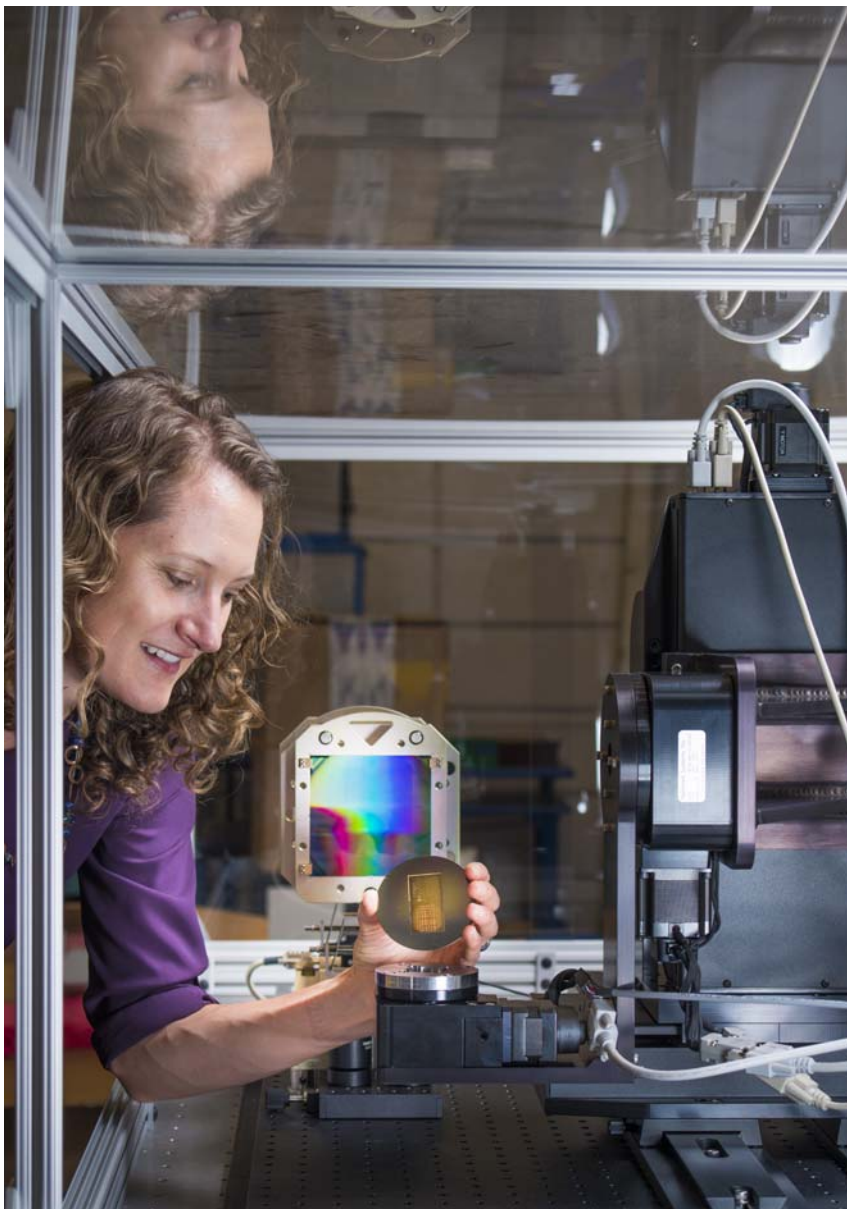
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July 21, 2017

California TEDS-like talk focuses on
techno-economic analysis
See page 3



X-ray vision

Peeking into the softer side of materials

By Sue Major Holmes

It's hard to get an X-ray image of low-density material like tissue between bones because X-rays just pass right through like sunlight through a window. But what if you need to see the area that isn't bone?

Sandia studies multitudes of low-density materials, from laminate layers in airplane wings to foams and epoxies that cushion parts. So Sandia borrowed and refined a technique being studied by the medical field, X-ray phase contrast imaging, to look inside the softer side of things without taking them apart.

The Labs has to be able to spot defects before they might cause a high-consequence failure, because materials don't perform well with voids or cracks or if they're separating from adjacent surfaces. For example, conventional X-rays can't see a defect called a grafoil in the laminate layers of an airplane wing without removing the protective copper mesh that diffuses energy if lightning hits. And they can't see the critically important foams and other materials that guard against shock, high voltage breakdown, and thermal stresses in nuclear weapon components.

"For low-density materials like plastics, polymers, foams, and other encapsulants, this phase signal can be a thousand times bigger than the absorption signal of conventional X-ray."

(Continued on page 4)

RESEARCHER AMBER DAGEL holds a calibration sample to be loaded into Sandia's X-ray phase contrast imaging machine. Amber is principal investigator for the Labs' work into using the technique to study low-density materials. (Photo by Randy Montoya)



Meet Dave Douglass

'Once-in-a-lifetime' chance to work at Sandia drew new Deputy Labs Director from a happy retirement by the lake.

Story on page 8

New fellowship named for former Labs Director Jill Hruby

By Sue Major Holmes

Sandia has established a new fellowship program, named after its immediate past director Jill Hruby, in hopes of attracting and recruiting talented women in engineering and science fields who are interested in becoming technical leaders in national security.

The Jill Hruby Fellowship Program will immerse postdoctoral candidates in a three-year technical leadership development program, including mentoring by executives and exposure to national security policy.

"I am honored to have a fellowship in my name to inspire science and engineering in public service, and that recognizes leadership as an important element of contributing to Sandia Labs and across the Department of Energy," Jill says.

The program will help prepare fellows to lead technical areas at Sandia and other national laboratories and national security organizations. It complements the existing Truman Fellowship, which is geared toward developing researchers.

The fellowship, which will begin in fall 2018, is open to all qualified applicants. To apply visit www.sandia.gov/careers and search for job number 658086. Applications will be accepted through Nov. 1. As postdoctoral employees, fellows will do independent research, choosing their own topics, in support of Sandia's purpose to develop advanced technologies to ensure global peace. They will collaborate

with the Laboratories' scientists and engineers and will work at either Sandia's New Mexico or California location. Since candidates will be selected each year, more than one fellow will participate simultaneously after the inaugural year.

"When I was at Los Alamos National Laboratory, I was delighted to see that Sandia had selected Jill Hruby as the first woman to lead a National Nuclear Security Administration laboratory," says Associate Labs Director Susan Seestrom, part of the team that developed the fellowship. "Now that I am a Sandia employee, I am impressed with the leadership legacy she left here. I think that the Jill Hruby Fellowship will be a great way to both honor her contributions to Sandia and as a focus to encourage women to



JILL HRUBY



FORMER LABS DIRECTOR JILL HRUBY checks out BaDx, the pocket-sized Sandia-developed anthrax detector (see the latest on BaDx in a story on page 5). Sandia has established a fellowship in Jill's name to carry on her lifelong passion of encouraging women to pursue and succeed in STEM careers. (Photo by Randy Montoya)

think about technical careers at Sandia."

Labs Director Steve Younger says he and Susan envision the program "as a vehicle for attracting outstanding candidates of demonstrated academic achievement and leadership talent to the Laboratories. In time, the program should become nationally recognized as a way of attracting top talent to the DOE complex."

Jill was Sandia's director from July 2015 through April 2017, the first woman to lead a national security laboratory. She worked for Sandia for 34 years, first at its California site beginning in 1983. She moved to the main New Mexico site in 2010 as a vice president overseeing counterterrorism, homeland security, energy security, and nuclear, biological, and chemical security. Last year, the Society of Women Engineers presented her with the Suzanne Jenniches Upward Mobility Award, which celebrates an individual's success in a significant management role and contribution to decision-making within their organization.

That’s that

Messy-deskers of the world, unite! Researchers at the University of Minnesota have discovered what we’ve known about ourselves all along – our cluttered workspaces with their heaps of reports, papers, and memos, our tornado-struck desktops with their strewn-about coffee cups, legal pads, books, pens, and sticky notes – that muddle of stuff is a sign not of our terminal messiness but of our abundance of creativity. At least that’s what the UM research suggests.

In a study published in *Psychological Science* and reported recently in the news media, the Minnesota researchers write that they found a clear correlation between a messy desk and creative, out-of-the-box thinking. In their study, researchers divided test subjects into two environments: half in a spic-and-span, orderly workspace and half in a jumbled, disorderly space. They then asked the subjects to think of new uses for ping pong balls.

Both test groups came up with a similar number of ideas. But – as you’ve already guessed – the subjects in the messy workspace came up with more creative ideas (as judged by researchers) than those in the orderly space. In fact, researchers said, the messy cohort’s ideas were “28 percent more creative.” How they came up with that very specific “28 percent” assessment seems a bit of a stretch to me, an attempt to put a hard number on a soft subject.

The study has come in for its share of criticism online, criticism that may be more appropriately aimed at how the media has reported the study than anything the study itself actually says. For example, one news site headlines its story about the study as “A Messy Desk Is a Sign of Genius, According to Science.” Another story includes the assertion that “a messy desk is a sign of an innovative mind at work, not a chaotic one.” There are plenty examples along the same lines. But the study itself isn’t about geniuses or innovative minds as such; it seems to be saying that anyone placed in a messy environment is likely to be more creative, but only while in that environment. The same person placed in an orderly environment is more inclined to display conventional inside-the-box thinking.

The messy/creative correlation may be real; anecdotal observation has long associated a messy desk with a creative mind. Ponder what Albert Einstein, perhaps history’s most notorious messy desk person, said: “If a cluttered desk is a sign of a cluttered mind, of what, then, is an empty desk a sign?” Hmmmm. Maybe I better strew some papers around my office and spill the coffee on my desk before my next PMF.

* * *

Well, we’re up to 48 . . . the 48th anniversary, that is, of the Apollo 11 moon landing, an event I like to take note of each year. The most familiar quotes from that mission will resonate down through history: the words spoken by Neal Armstrong: “Houston, Tranquility Base here, the Eagle has landed;” and “That’s one small step for man, one giant leap for mankind.” And the haunting phrase from Buzz Aldrin describing the moonscape: “Magnificent desolation.”

Memorable lines, to be sure, but the real poetry of the mission is in the routine exchanges between the astronauts and Mission Control. Numbers, systems checks, to-do lists, and numbers, numbers, numbers: the transcripts are a glimpse into the creative heart and souls of engineering itself – exchanges describing systems of systems working together like the notes of a Beethoven symphony or the words of a Shakespearean sonnet where the total is far greater than the sum of the parts. In its ability to lift and move the human heart, the Apollo 11 moon landing equals, perhaps even transcends, our greatest art.

For me, the Apollo saga is a powerful origin story of mythic proportion, one I’m drawn back to year after year, decade after decade. Like all origin stories, the story of Apollo never grows old but constantly renews itself. It’s a story for which close study is always rewarded with fresh insights.

My hope, though I am now far closer to my end than my beginning, is that I will be here long enough yet to see us go back to the moon and beyond. It is, for me, very much as described by Leonardo DaVinci: “For once you have tasted flight you will walk the earth with your eyes turned skywards, for there you have been and there you will long to return.”

See you next time.
– Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)

Recent Retirees



New Mexico photos by Michelle Fleming
California photos by Randy Wong



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32 9344



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31 10656



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NNSA launches
ROTC pilot program

While visiting Sandia in June, Brig. Gen. Michael Lutton, NNSA Principal Assistant Deputy Administrator for Military Application, presented certificates to Reserve Officers Training Corp (ROTC) students Ashleigh Begay (in photo at left), Trenton Dean, and Sean Fattor. The three University of New Mexico ROTC students were selected to be the pilot class for the NNSA’s Defense Programs ROTC Collaboration Internship Program, which provides ROTC students with internships at NNSA laboratories and sites. The three ROTC students reported to Sandia on June 6 to begin six-week internships. Ashleigh will be interning at the Center for Integrated Nanotechnologies, Trenton will be interning with the nuclear weapon power source development organization, and Sean will be interning with the nuclear weapon surveillance organization.

From ideas to inventions

Brandon Heimer delivers TED-like talk on Techno-Economic Analysis



THE WORTH OF AN IDEA — Brandon Heimer delivers a TED-like talk on techno-economic analysis.

(Photo by Krissy Galbraith)

By Michael Padilla

What's the value of your technology? That question was the subject of a recent TED-like talk presented by Sandia systems analyst Brandon Heimer (8712). Brandon discussed how techno-economic analysis (TEA) can help transform ideas into inventions that create social value.

He focused on how TEAs can assist researchers in determining the worth of their technologies and research, as well as the cost associated with producing inventions at commercial scale. In his remarks, Brandon made the case that the competitiveness of a new technology in the marketplace is largely a function of the value created for users of that technology and the price charged for it.

"TEA tools can estimate the cost of producing new technology products to help innovators determine whether their inventions are commercially viable relative to existing products and substitutes on the market,"

Brandon said. "Using these data-driven analyses can help R&D organizations successfully transfer technology developed at Sandia to the marketplace."

Performing a TEA before beginning a project can enable researchers to quickly gauge the commercial viability of their ideas, Brandon said.

"When initial assessments return unfavorable results, innovators can identify factors that must change to increase the viability of their ideas and refocus their research efforts on other projects with greater potential," he said.

According to Brandon, TEAs with favorable results can help researchers clearly articulate the value propositions for their R&D, forming the basis for proposals with strong appeal to stakeholders and funding agencies. The TEA process can identify the highest costs for producing technologies and inform research decisions to prioritize R&D efforts that will provide the greatest benefit. In addition, multiple TEA scenarios can be evaluated to help researchers choose among competing



technology approaches.

With regards to the TED-like talk process, Brandon says the preparation was fun but required quite a bit of work. "The TED format is quite different from the technical talks researchers are more familiar with here at Sandia," he says. "For one thing, the slides are much more minimal."

Brandon recommends that anyone interested in presenting a TED-like talk be prepared to commit much more of the story to memory and become familiar with both the TED style and process. "And, last but not least," he says, "practice, practice, practice."

Brandon says he would be happy to speak to anyone interested in TEAs or the TEA process. Contact him at bwheime@sandia.gov or 925-294-3557.

Employee death, New Mexico site

Steady-as-a-rock Randy Hudgens passes away at age 57

'Let's ask Randy' was often heard when colleagues ran into a problem that needed a quick solution

Who do you turn to when the chips are down? For his colleagues the answer was often Randy Hudgens. Randy, a member of High Integrity Systems Dept. 2622, passed away in June at age 57 after more than 20 years at Sandia as both contractor, and, since 1997 as an employee.

According to manager Matthew Brown, Randy was a Jack-of-all-trades and master of them all.

"Randy was an ideal co-worker who would take on any task the team needed done," Matthew says. "He was solid and dependable and a friend to all. Not only could we always count on Randy to keep his commitments, but he would often anticipate what was going to be needed and take the initiative to have it ready ahead of time."

In the 10 years he worked with him, colleague Brent Meyer says Randy designed and/or implemented perhaps a dozen printed circuit boards for him. "Each one was a joy because he was such a blessing to the effort," Brent says. "I would sketch an idea or sometimes just chat with him about what was needed. Randy would dive in and give his best effort every time. Unknowns didn't bother him — he would just search out the solutions or ask the questions necessary to keep moving forward."

Randy, Brent recalls, always provided "a cheerful bounce" to his teams. "Even during this last year, despite all of his health issues, he was still offering smiles and quips. Randy truly was a source of goodness and blessing for all those who knew him."

Will hold Randy in her heart

When Eileen Snyder joined Dept. 2622 in 2010 as an OAA, "Randy was one of the first people to make me feel welcome to the group; he would always make it a point to say hello every day."

During the seven years they worked together, Eileen became very familiar with Randy's generous, big-hearted nature. Once, while visiting him in his office, she admired out loud a little solar-powered pink flying pig he had in his window.

"Well the next day, not only did he give me his flying pink pig, but he had his wife Tena go out and get me an array of characters. I have quite a collection now, because he then brought me one for every holiday."

Over the years of getting to know him, Eileen says, "I can say he became a very good friend. I got to meet Randy's wife while visiting him in the hospital and we've become friends, too. I will always hold Randy and his family in my heart."

Randy, says Patricia Tempel, "was very much a part of our work family. He was a colleague but mostly he was a good friend." Patricia says she was always struck by Randy's work ethic, commitment, and get-it-done attitude. "He was always willing to help everyone," she says. "The thing I will always remember about Randy is that



RANDY HUDGENS

he was such a kind and caring person with a brilliant smile. He touched our hearts and will be missed."

Glenn Russell worked with Randy for most of two decades and found him to be one of those colleagues who always came through, who would never let you down.

"He performed a wide variety of tasks including circuit board designer, board and cable assembly, alternate evacuation team captain, communications security team member and parts procurement expert. Whenever we had a problem concerning any of these areas — and others I haven't mentioned — the answer was always the same: 'Let's ask Randy.' He was always cheerful and often knew the answer to our problem immediately and if necessary he'd drop whatever he was doing to help us. Always without complaint. Without ever being required to, he kept a stash of cables, connectors, and other items that he knew we would need eventually. He was very good at that."

It would just get done

Deborah Lynn Jensen first began working with Randy in 1995, when he was a K-Tech contractor to Sandia.

"I was lucky that Randy was assigned to support the Key Data Processor (KDP) development team that I was leading as a part of the Selective Availability Anti-Spoofing Module [SAASM] program for the GPS Joint Program Office — now known as the GPS Directorate. He was always my go-to-guy for whatever I needed. No matter the task he would never hesitate to take it on, and once I had assigned a task to Randy I never had to give it a second thought — it would just get done, no questions asked."

In his early days as a contractor, Deborah recalls, Randy's job was focused primarily on ordering supplies and parts, designing and assembling printed circuit boards, and testing and troubleshooting the team's software-based designs. However, she adds, "he quickly branched out into other critical areas. In fact, Randy became such an essential part of the KDP team that we were able to hire him as a regular full-time Sandian in 1997."

One of Randy's responsibilities was the development and maintenance of the KDP design file, which consisted of critical design documents, software packages, and design schematics. To efficiently manage and distribute all of these classified documents to external developers, Deborah says, Randy developed a system for compiling and cataloging each KDP design file release onto a single CD-ROM, the contents of which were fully html-linked for viewing on Internet browsers. His system was so efficient that he provided a briefing and demonstration of it to the Agility Forum. "Remember," Deborah says, "this was in the mid-1990s, so Randy was on the leading edge of Internet browser technology!"

"Randy was always the quiet and steady guy on the team, the guy who never dropped the ball. His stoicism through the years he was battling cancer was remarkable, and his thoughts were always centered on taking care of his teammates and his family. He truly was a model and an inspiration for us, and he will be missed by everyone who had the privilege of working with him."

— Bill Murphy



AN ORANGE illustrates three different images from an X-ray phase contrast imaging system. The absorption image, left, the same as a conventional X-ray image, shows how dense a sample is. A dark field image, center, is sensitive to a sample's microstructure, scattering the X-ray. The phase contrast image, right, sensitive to the different materials within a sample, shows the changes from one material to another.

Soft materials X-rays

(Continued from page 1)

X-ray phase contrast imaging measures not just the number of X-ray photons that get through the sample, as in conventional X-ray imaging, but also the phase of the X-rays after they pass through, offering a complete look at interfaces inside a structure.

"For low-density materials like plastics, polymers, foams, and other encapsulants, this phase signal can be a thousand times bigger than the absorption signal of conventional X-ray," says principal investigator Amber Dägel (5228).

X-ray phase contrast imaging could be used to inspect microfabrication packaging, integrated circuits, or micro-electro-mechanical components and could be used to study ceramics, polymers, chemicals, or explosives.

Sandia's technique achieved X-ray phase contrast imaging in a lab without a synchrotron, an expensive piece of equipment the size of a football field.

More sensitive technique needed

Other current techniques aren't sensitive enough to distinguish between materials. "You have a dense material mixed in with a low-density material, and traditional X-rays can't see that low-density material," Amber says. "So they don't know if the gaps are filled with the low-density materials or if that's air."

Take an orange. Amber had one in her office and, recognizing it's really just low-density materials, she and her colleagues imaged it to demonstrate their system.

A conventional X-ray picture of an orange is fuzzy, without detail. X-ray phase contrast imaging clearly shows the differences between the thin layers of zest and pith and how those layers look compared to the thick pulp.

"When light hits the zest, it bends a little. It hits the pith and it bends a little bit more, then it goes through the pulp, and it bends in another direction," Amber says. "Every interface, every time the material changes

within the sample, it bends the light a little bit. Different parts of your sample bend the light differently, and measuring that is what gives rise to the phase contrast image."

Sandia's research began with a Laboratory Directed Research and Development project from 2014-2016 under program manager Brad Gabel (5844) that demonstrated X-ray phase contrast imaging could show details where one material meets another. Airplane wing laminates the new technique studied were provided by Dennis Roach (6620) and Thomas Rice (6621). The team's current effort to look at foams and voids is funded through the nuclear weapons investment area. The program manager for the new effort is Rita Gonzales (2620).

A new LDRD takes the next step, learning to make gratings that operate at higher X-ray energies.

Gratings — optical components that look like bunches of upright parallel bars — create interference in the X-ray beam, like an interferometer, merging sources of light to create an interference pattern that can be measured.

Sandia is studying it for materials science applications.

Gratings make Sandia system possible

The system uses three gratings, the first a centimeter square and the others 4 inches square. The first and third gratings are transmission gratings, a series of closely spaced parallel slits that let X-rays through. In between the slits is a dense material, such as gold, that blocks X-rays. The middle grating is a phase grating, made of a low-density material like silicon. It lets all the light through, but splits it into two beams.

"Each tiny slit in the first grating acts like a tiny X-ray source. The small size is necessary to make an interference pattern," Amber says. "The phase grating splits the beam into two beams that form a pattern of bright and dark, an interference pattern. The final grating is like a ruler to measure how that bright and dark pattern changes with a sample in the system."

The detector behind the last grating captures images of those changes.

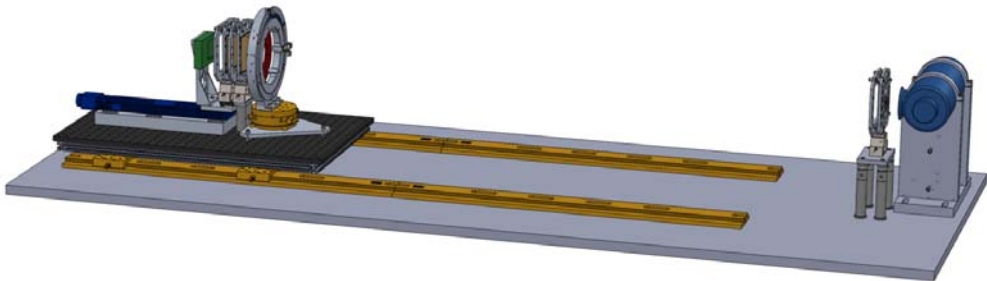
"By sampling the bright and dark pattern we're able

to reconstruct on the detector what this pattern must have looked like," Amber says. "That's if the light just goes through with no sample there. What if now I put something, like an orange, in front of it?" The light wave is delayed even more going through the orange, "so now you took that waviness and you gave it even more shape. We're measuring how this wave front, this phase, changes as it passes through the sample."

Amber says she believes the technique eventually will have an enormous impact, both for research and quality control on the factory floor.

"I think it can be useful in the research phase, when you're trying to understand the distribution of microbeads within an epoxy or how the foam is mating with the canister it's filling up — is there a gap there? Or what defects can I see in my airplane wing laminate?" she says. "I also think it can be used in quality assurance: I know what my part should look like, but I need to make sure there aren't cracks, there aren't voids."

Amber and colleagues have presented their research at several conferences, including the International Workshop on X-ray and Neutron Phase Imaging with Gratings in 2015 and the SPIE Defense + Commercial Sensing conference last year.

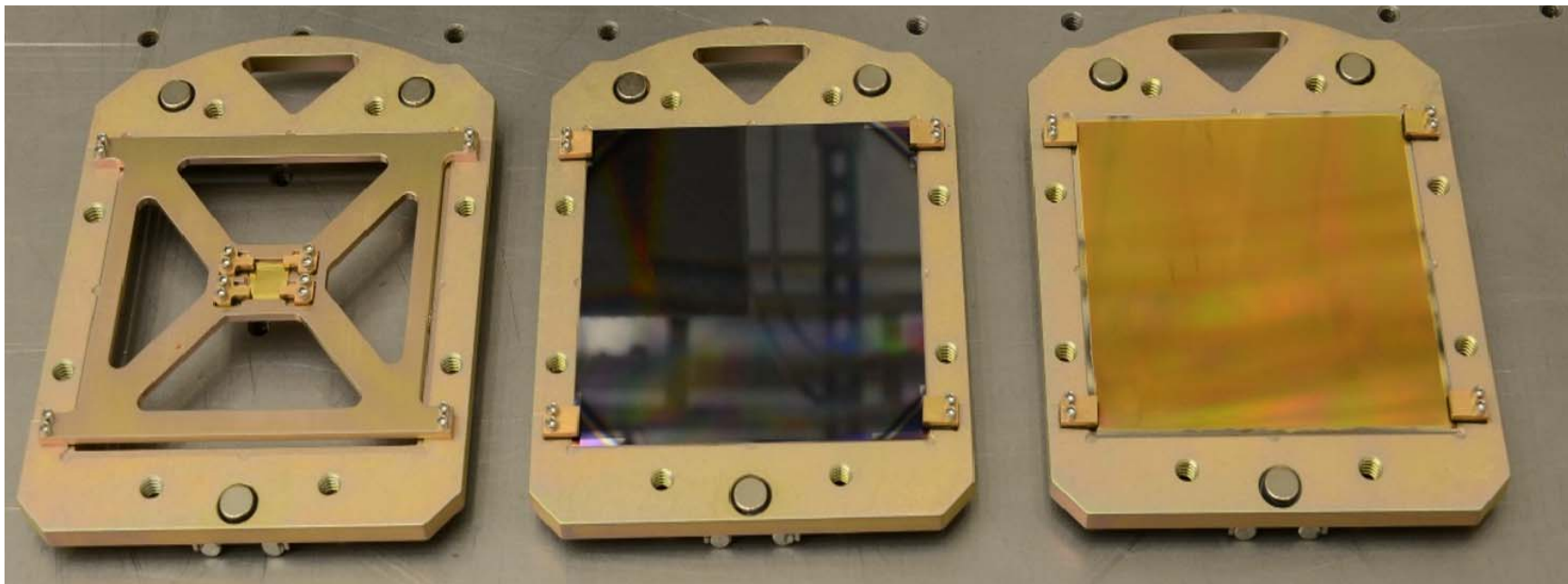


SYSTEM OVERVIEW — Sandia's X-ray phase contrast imaging system fits on a laboratory table. The source grating fits in front of the X-ray tube on the right, creating an array of tiny X-ray sources, which travel to the sample that sits in the ring. Behind the sample are phase and analyzer gratings and the detector.

Gratings are critical to the technique, and using them at higher energies "will let us look at more samples, samples that are denser or samples that are bigger," Amber says.

They're difficult to make but Amber says the metal micromachining team of Drew Hollowell, Carlos Perez (both 5228), Patrick Finnegan (1853), and Jon Coleman (1815), led by Christian Arrington (5228), makes highly uniform ones up to 4 inches square. That's considered large scale, and Sandia is able to make gratings as one large piece with good uniformity, she says. Grating size determines how much of a sample can be seen at once. Most other groups studying phase contrast X-ray imaging are looking into the technique for medical imaging, while

GRATINGS FABRICATION — Sandia's metal micromachining team fabricates gratings that make X-ray phase contrast imaging in a lab possible. The source grating, left, is an array of slits that let X-rays through, acting like many tiny X-ray sources. The phase grating, center, splits the beam in two, creating an X-ray interference pattern. The analyzer grating, right, has very small lines and openings and is used to measure the interference pattern.



On the trail of a killer

Anthrax is deadly and hard to detect. Sandia's BaDx — a mini-lab the size of a credit card — makes it easier and cheaper to pinpoint the bacteria. With help from the labs' technology transfer programs, BaDx is moving closer to market.

By Nancy Salem

One of the world's most common bacteria is also one of the deadliest. *Bacillus anthracis*, the bacteria that causes anthrax, is found in soils all over the world and can cause serious, often fatal, illness in humans and animals. It can survive in harsh conditions for decades, and people can be exposed through skin contact, inhalation of spores, or eating contaminated meat.

Detecting anthrax is challenging because samples for testing must be propagated in a laboratory that uses specialized tools requiring a consistent power supply, something often unavailable in the developing world. "Working with dangerous samples like *B. anthracis* spores places laboratory staff at risk," says Melissa Finley (6825), a veterinarian and member of Sandia's International Biological and Chemical Threat Reduction organization. "Concentrating many positive test samples in a lab could also tempt someone to steal positive anthrax samples for nefarious uses."

Another barrier is cost. "Farmers in many developing countries don't make a lot of money, so they don't pay for diagnostic testing often," Melissa says. "When they do, they can't afford to pay a lot for it." The most common diagnostic test for anthrax costs around \$30, which is out of the reach of many farmers, perhaps discouraging them from testing animals they suspect are infected, Melissa says.

Sandia has developed a safer, easier, faster, and cheaper way to detect anthrax and is working with an Albuquerque company to commercialize the technology. Dubbed BaDx (*Bacillus anthracis* Diagnostics), the credit-card-size device, a mini-laboratory, can detect the anthrax bacteria in places with no power, refrigerated storage, or lab equipment. It could cost around \$5-\$7 and requires no specialized tools and minimal or no training.

The technology was licensed to Aquila, a New Mexico woman-owned small business that specializes in the design and manufacture of technologies and services for nuclear security and international safeguards. Aquila is working with Sandia through a Cooperative Research and Development Agreement to complete testing with

PREPARING TO MARKET — The BaDx technology has been licensed to Aquila, a New Mexico company that specializes in the design and manufacture of technologies and services for nuclear security and international safeguards. Aquila is working with Sandia through a Cooperative Research and Development Agreement to complete testing with external partners and begin marketing BaDx. (Photo courtesy of Aquila)

external partners and begin marketing BaDx.

"This is a wonderful example of where sophisticated technology has enabled a practical solution to a very important problem," says Mary Monson, senior manager of Technology Partnerships and Business Development Dept. 1180.

Complex and sensitive, but simple to operate

A Laboratory Directed Research and Development project launched in 2011 in Sandia's International Biological Threat Reduction Program led to BaDx. While a large team helped develop the detector, the drivers were scientists Jason Harper (8631), Thayne Edwards, and Melissa.



BaDx needs no battery, electric power, or special lab equipment. It's hardy against wide temperature variation and can detect very small numbers of *B. anthracis* spores. A field technician puts a sample swab into the amplification chamber, which contains selective growth media. The device then uses a lateral flow assay, similar to a common pregnancy test, to detect *B. anthracis*. Magnetically operated valves allow the sample to advance from stage to stage to complete the testing process. A colored line appears on the device several

hours later if the test is positive for the bacteria.

The technician can then initiate a chemical process that sterilizes the device, avoiding the risk of positive samples accumulating and falling into the wrong hands. "The device amplifies the *B. anthracis* so it can detect as few as 100 spores instead of the typical 1-10 million required for detection," Jason says.

Developed with commercialization in mind

BaDx builds on Sandia's long-standing expertise in bioforensics, most visible in the work the Labs did in response to the anthrax spores mailed to media offices and two US senators in the fall of 2001, killing five.

Jason says BaDx was developed with commercialization in mind. "All the design considerations and performance standards were pointed toward marketing and getting BaDx out into the world," he says.

Thayne, who has since left Sandia, was working with Aquila on sensors through another Sandia tech transfer program, New Mexico Small Business Assistance, and mentioned BaDx. "We were about a year into the project and already had a prototype that demonstrated proof of concept," Jason says. "We set up meetings and brought the prototype. They liked it, and we were off and running."

Aquila was manufacturing within six months and is well into final external testing. "We see a lot of potential for government customers and nongovernmental organizations as well as commercial markets," says Aquila's chief scientist Markku Koskela. The company anticipates future models of the device that will detect *E. coli*, salmonella, valley fever, and group A strep.

In 2015, BaDx was recognized by the Federal Laboratory Consortium with its national Award for Excellence in Technology Transfer. It also won an R&D100 Award in 2014, a TechConnect World 2015 National Innovation Award, and was named by *Popular Science* magazine as one of the greatest innovations of 2015.

"Aquila has been a great partner and its commercializing of this technology will help us fulfill our mission of serving the public good," Mary says.

HANDS-ON LIVESTOCK WORK — Melissa Finley, a veterinarian and member of Sandia's International Biological and Chemical Threat Reduction organization, has worked in Afghanistan since 2009 teaching safe laboratory practices, providing continuing veterinary education to reduce the spread of infectious disease, and collaborating with the government's animal health agencies. Her experiences influenced the development of the Labs' BaDx anthrax-detecting technology. (Photos courtesy of Melissa Finley)



Mileposts



*New Mexico photos by Michelle Fleming
California photos by Randy Wong*



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Ed Klaus
30 6522



John Klem
30 5266



John Mason
30 5332



Perry Robertson
30 5211



Tammy Eldred
25 6335



Antoinette Lynch
25 10261



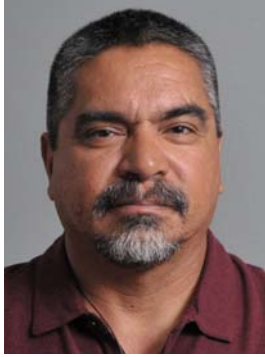
Dave Schoenwald
25 8813



Dan Sherman
25 2325



Rusty Elliott
20 11100



Christopher Gallegos
20 5352



Regina Griego
20 2127



Leroy Martinez
20 10774



Jim Stewart
20 1440



Joel Boyer
15 10654



Chris Collins
15 155



Jane Ferrizz
15 1534



Tracy Flynn
15 10765



Jennifer Gaudio
15 6820



Debbie Grady
15 3334



Brent Jones
15 1688



Anne Lacy
15 2582



Paul Lemke
15 2626



Delia Madrid
15 10659

Fighting fires

CANYON YOUNG, son of Jeff Young in Fleet Services Dept. 4745, is serving with the US Forest Service this summer as a wildland firefighter. Canyon, a senior at New Mexico State University, is majoring in range science. The photo here was taken in the Coronado National Forest above Safford, Arizona, during the 50,000-acre Frye Fire. Canyon is in back of this photo closest to the air tanker. Sandia, through its Critical Skills Masters Program, has funded research into early wildfire detection and fuel mapping to increase safety for firefighters.

(Photo by Trey Bouvier, USFS)



SANDIA CLASSIFIED ADS

Note: Classified Ad deadline change for the Aug. 18 edition. The deadline will be Thursday, Aug. 10 at noon instead of Friday, Aug. 11.

MISCELLANEOUS

ELLIPTICAL BIKE, X Octane Fitness XR6CE, \$1,700 OBO; Rocky Mountain sauna, model XQ-021HDB, \$1,800 OBO. Fisher, 505-293-2864.

DINING ROOM SET, table w/pad protector, 2 leaves, 6 chairs & hutch, excellent condition, photos available, \$675. Sanchez, 505-681-3908.

SILVER FOX JACKET, small, worn twice, \$200. Jaramillo, 263-2153.

1950's VINTAGE LIVING ROOM SET, couch, rocker, arm chair, 2 end tables, excellent condition, cushions could use recovering, \$1,500 OBO. Paz, 237-8407.

FURNITURE, rocking chair, Ethan Allen, early Americana, \$65; love seat w/twin sleep sofa, Flexsteel, brown tartan-style, upholstery, \$100; excellent condition. Hoyal, 823-1421.

READINGS FOR DISCUSSION, by the Great Books Foundation, Plato, Aristotle, Shakespeare, Joyce, Tolstoy, Thoreau, etc. \$6. Wagner, 505-504-8783.

STORM DOOR, brown w/double hung, removable glass panes, \$25. Bodette, 505-275-9722.

STEELCASE CABINET, 36"W x 41"H x 18"D, 2 drawers, bookcase w/doors, good condition, heavy-duty, photos available, \$35 OBO. Roesch, 235-0686.

WOODWORKING LATHE, classic General 26020, variable spd., 220 or 120V, many attachments, excellent condition, \$2,000. Wagner, 505-275-2010.

GIRL'S BED & MATTRESS, full size, white, excellent condition, text for photos, \$350. Armijo, 505-550-0954.

HARLEY-DAVIDSON JACKETS, leather, 2X, Harley Screaming Eagle jackets, chaps, photos available. Hanks, 249-1931, call or text.

EVAPORATIVE COOLER, Port-A-Cool Cyclone 2200, cools 500-sq. ft., used 1 season, paid \$600, asking \$450. Russo, 286-0989.

BABY ITEMS, crib, play yard, high chair, swing, clothes, etc., contact for more info; Bowflex Sport, w/accessories, you pick up, \$200 OBO. Maestas, 505-550-0163.

PATIO TABLE, 68" x 40", 6 chairs, matching lounge, tiled buffet, end table, wheat colored, excellent condition, \$450. Cook, 505-256-5196.

VICTORIA'S SECRET, Bling hoodies, shirts, all new, w/tags, sizes & prices vary, selling whole collection. Baremore, 505-301-5671, ask for Kathie.

RUG, indoor, tan, 8' x 10', \$20; solar lights, 18, \$2 ea.; over-the-door closet hangers, metal, 3, \$3 ea.; lounge chair, fold-up, turquoise cover, \$15. Lewis, 323-7268.

DINING TABLE, antique, oval, 5 legs, drop-leaf, w/5 extension leaves, 56"-116", \$200. Hughes, 296-8940.

BICYCLE WHEELS, set (front & rear), Bontrager Race TLR (tubeless-ready), \$100. Kelly, 505-270-4485.

FLOOR MATS, Toyota brand, for '03-'09 4Runner, set of front & back, very good condition, \$30. Lucas, 369-8842.

How to submit classified ads

DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:

- EMAIL: Michelle Fleming (classads@sandia.gov)
- FAX: 844-0645
- MAIL: MS 1468 (Dept. 3651)
- INTERNAL WEB: From Techweb search for 'NewsCenter', at the bottom of that page choose to submit an ad under, 'Submit an article'. If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.

Ad rules

1. Limit 18 words, including last name and home phone (If you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
2. Include organization and full name with the ad submission.
3. Submit ad in writing. No phone-ins.
4. Type or print ad legibly; use accepted abbreviations.
5. One ad per issue.
6. We will not run the same ad more than twice.
7. No "for rent" ads except for employees on temporary assignment.
8. No commercial ads.
9. For active Sandia members of the workforce, retired Sandians, and DOE employees.
10. Housing listed for sale is available without regard to race, creed, color, or national origin.
11. Work Wanted ads limited to student-aged children of employees.
12. We reserve the right not to publish any ad that may be considered offensive or in bad taste.

TIMESHARE, Las Vegas NV, 1-bdr., 1 bath, full amenities, 7 nights, anytime Aug. 1-Oct. 31, \$700. Chavez, 505-550-8095.

MALIBU PILATES CHAIR, both springs included, good used condition, \$35. Jensen, 821-2373.

TRANSPORTATION

'11 TOYOTA VENZA, V6 AWD, remote start, back-up camera, 20-in. wheels, 30K miles, excellent condition, \$18,000 OBO. Fricks, 505-410-4413.

'96 PONTIAC FIREBIRD, limited edition, AT, 2-dr., T-Top, loaded, 67K miles, excellent condition, collector's classic, \$8,000. Romanelli, 505-717-1796.

'09 AUDI A4 2.0T QUATTRO, AT, red, one owner, 53K miles, excellent condition, \$15,000. Chavez, 915-892-3687.

'05 CHEVY SILVERADO, 4WD, silver, low mileage, call for more info & photos. Sorensen, 505-890-7163.

'12 SUBURBAN, LT, K1500, 4WD, 4-dr., black, recent major service, 94K miles, VIN#1GN-SKJE75CR284148. Donnell, 505-241-9111.

'05 HONDA ACCORD HYBRID, V6, 4-dr., heated leather seats, PW, PL, more, dark green, new tires, used as commuter, minor cosmetic damage, good condition, \$5,500 OBO. Valenzuela, 303-956-0645.

'06 FORD F150, Supercrew, 1/2-Ton, 4WD, 5.4L V8, 159K miles, great condition, \$13,975 OBO. Sanchez, 505-280-2843.

'91 HONDA ACCORD, 4-dr., white w/blue interior, Honda dealer serviced, Michelin tires, gas-saver, perfect condition, \$5,000. Behar, 821-9199.

'01 FORD F150, 4x4, Supercrew, clean, bed liner & extender, original owner, 85K miles, \$6,000 OBO. Lovato, 505-385-6289.

'03 FORD TAURUS SES, 102K miles, runs great, \$2,500 OBO. Michalski, 505-293-5574.

'03 HONDA CR-V EX, 5-dr., 4WD, AC, PW, cruise control, 38,940 miles, good condition, \$5,600. Connell, 505-554-1696.

'94 FIREBIRD CONVERTIBLE, Formula V8, loaded, original w/all documents, 12.5K miles, like new, \$13,500 OBO. Campbell, 294-6000.

RECREATION

'00 EXCEL 5TH WHEEL, 28 RKO, very good condition, \$11,000. Fluckey, 505-980-5009.

'15 STEALTH TOY HAULER TRAVEL TRAILER, Arctic pkg., 4 KW generator, great condition, \$26,500 OBO. Jakaboski, 505-933-5532.

'08 YAMAHA VINO 50 SCOOTER, maroon, w/extras, 11K miles, \$800 OBO. Krok, 626-676-1052.

REAL ESTATE

2-BDR. HOME, new bath, updated kitchen, 800-sq. ft., south UNM area, beautiful, \$169,000. Prior, 505-239-9586.

3-BDR. HOME, 2 baths, 1800+-sq. ft., 2-car garage, w/custom cabinets, solar panel, open concept, fully remodeled, Four Hills, MLS#895175, \$265,000. Newell, 296-1500.

4-BDR. HOME, 3 baths, 2,660-sq. ft., 7420 Willow Spring NE, La Cueva neighborhood, \$385,000. Lin, 505-369-5312.

Dave Douglass

(Continued from page 8)

to see my son become a father — that was a very rewarding and happy moment.”

The pleasures of woodworking

As Dave's career has advanced he has inevitably moved away from hands-on engineering and he misses that. He makes up for it, though, through one of his great passions: woodworking.

“I've always loved working with wood, ever since I was in 7th grade and took my first shop class. Now I have a very comprehensive woodworking shop back at my home at the lake.” He builds furniture and has done a lot of the cabinets for a remodel of the house.

“By having my own woodshop I can design my own furniture and at the end of the day I can look at what I've done and say, ‘That's progress. I've made progress today.’ I do love doing that.”

Between the woodworking and the fishing and an occasional round of golf, Dave finds plenty to occupy his free time. He's not much for TV or movies, but enjoys reading a good action thriller in the Tom Clancy style or anything about history; author David McCullough is a favorite. And his musical preferences run to country of the classic kind: Waylon, Willie, Johnny Cash, Merle Haggard. “I'll occasionally listen to a bit of jazz or get a little retro and go back to the 1970s rock, but country music is my favorite,” he says. In fact, if Dave could crank back the clock, he wishes he could make his own music.

“One of my biggest regrets is not learning a musical instrument as a kid,” he says. “Back then I was into sports — I didn't have time for that music stuff. I regret that now. When the grandkids come visit us at the lake, we always have a campfire. It would be nice to be able to play the guitar and have some family sing-alongs there.”

Dave might like the idea playing the guitar with his family, but chances are he wouldn't play for a wider audience. The people who know him best, Dave says, would describe him as quiet and he describes himself as reserved, “an introvert by nature.” He says he finds the more public aspects of his job to be the most challenging.

“I can be outgoing, but at the end of the day I need my time alone,” he says.

Being Deputy Labs Director at an organization as complex as Sandia is a job with many dimensions. Dave says his favorite part is “getting out and meeting the people and seeing all the different things we do here. I think I have the best job at the Labs because I get to go out and see virtually everything and talk to virtually



A GOOD HAUL— After a day of fishing on Milford Lake in Kansas in the early 1990s, Dave Douglass (at left) and his three sons and father-in-law show off their day's catch. (Photo courtesy of Dave Douglass)

everybody.” But then again, he notes, “I talk to a lot of people who think they have the best job at the Laboratories; that's one of the great things about Sandia.”

If Dave ever had any doubts about taking on the job at Sandia, that ambivalence was quickly dispelled once he started meeting with members of the staff.

“What's impressed me the most,” he says, “is the passion of the people who work here for what they do. I've worked in a lot of different organizations over the years but I have never worked in a place where virtually everybody cares and loves what they do the way they do here. That in and of itself makes this a very unique place.”

Accessibility a priority

Dave says he and the rest of the new leadership team want to be accessible to the staff. “That's one of our priorities — to get out and meet the people,” he says. “That's very important to us. We understand that given our leadership positions, sometimes the role itself can intimidate people. We want folks to know that we put our pants on the same way as everybody else.”

It is early yet to start talking about legacies, but Dave

says that when he leaves Sandia, “I hope people will say, ‘The Labs is better off because he was here.’”

“Steve and I and all of us in leadership have been pretty explicit with folks that one of our objectives is ‘Don't break Sandia.’ There are so many things that make this place special and we don't want to break it. But at the end of the day, I hope we can make it better.

“We know we have to deal with things like the Trusted Microsystems capability or a MESA replacement. We have to deal with foundational capabilities like what are we going to do with Z in the next 15 years. Those would be the kinds of things that, if we get them right, people will say, the Laboratory is better because they were successful at those things.”

Having spent 10 years in Phoenix earlier in his career, Dave and his wife Tammy are familiar with desert living and enjoy their new home in Albuquerque. But when they get the chance, they will continue to take weekend trips and vacations back to their home on Beaver Lake. And there, you'll almost surely find Dave standing on the shore, his grandkids at his side, showing them how to find the best flat rocks for skipping out across the water.

Once-in-a-lifetime chance to work at Sandia enticed Dave Douglass out of retirement

By Bill Murphy

Picture this scene: It's the early 1960s and a boy, a little boy, maybe 3 or 4 years old, is at the lake with his family. The visits to the lake, a regular summer rite, become an integral and formative experience, shaping the boy into the man he became.

On this day, the boy stands on the shore and, doing it just the way his dad and grandpa do it, he skips stones across the water, good flat ones, just like his dad showed him. When a stone skips the way it's supposed to, he sees a big grin light up his dad's face.

That, in broad strokes is Dave Douglass's first childhood memory: An early exclamation point on a happy boyhood at Table Rock Lake, Missouri.

Now fast-forward five decades. Dave, after a career of consequence and accomplishment, is happily retired at his home on Beaver Lake in Arkansas, where he and his wife, Tammy, are enjoying life to the fullest, especially savoring the chance to spend quality time with their three grandchildren. Dave, who spent several years as president of the Honeywell-managed Kansas City Plant, now can do the things he really loves: fishing, boating, and crafting furniture in his custom woodworking shop.

As far as Dave is concerned, nothing, but nothing, is going to disrupt this long and carefully planned phase of his married life.

"I was perfectly happy in retirement," Dave says now. "I'd been retired three years. I'd gotten a lot of phone calls during that period — 'Would you be interested in this?' — and pretty much the answer was always 'No, and don't call me back.'"

'Let's do this'

"I had no plans to go back to work. I was at the lake, I was in my woodshop, getting to see my grandkids a lot, but when the folks called about being part of the team to manage Sandia, it didn't take long, just a quick discussion with my wife, to say, 'Let's do this.' We knew it would disrupt that comfortable lifestyle that we worked for, but I knew the lab well enough [from his time at KCP, which works closely with Sandia] to know how cool a job this was going to be.

"I could easily have stayed fishing; I was very comfortable there, but this was a once-in-a-lifetime opportunity. You just can't say no to being part of something like this."

Although the forests and rivers and lakes have beckoned Dave all his life, he's a city boy, born in and raised in Kansas City. He was a third-generation employee at NNSA's Kansas City Plant, renamed since Dave retired as the Kansas City National Security Campus. Dave's father led one of the plant's electrical engineering groups and his grandfather ran the model shop. Sadly, neither lived long enough to see Dave rise to the top of the plant's org chart.

"Steve and I and all of us in leadership have been pretty explicit with folks that one of our objectives is 'Don't break Sandia.' There are so many things that make this place special and we don't want to break it. But at the end of the day, I hope we can make it better. We know we have to deal with things like the Trusted Microsystems capability or a MESA replacement. We have to deal with foundational capabilities like what are we going to do with Z in the next 15 years. Those would be the kinds of things that, if we get them right, people will say, the Laboratory is better because they were successful at those things."



DAVE DOUGLASS



OUTDOORSMAN — "If I'd had my druthers, I'd have gone into forestry," says Sandia Deputy Labs Director Dave Douglass, "but I had a wise counselor through our church group in high school and he sat me down and said, 'You know, there are 5,000 forestry graduates every year in the United States and there are 100 jobs.' That's when I decided to go into engineering." Despite his change in career focus, Dave still enjoys spending as much time outdoors as he can, especially fishing with his grandkids. (Photo by Randy Montoya)

Dave was a good, attentive student in high school, but school didn't consume his whole life. "School was school," he says. "I liked school and I did well in school, but I wasn't one of those guys who lived for school. When school was out I was ready for school to be out, ready to go to the lake, get outdoors. In the summer-time we were always outdoors."

During high school, Dave did gymnastics for a while but his true love was basketball, a love that was unrequited. Hard as it is to believe now, Dave, who stands 6'2", was one of the smallest boys in his class, far too small to play basketball at the competitive level. "During my sophomore year in gym class, there was only one other guy in my class I could wrestle because I was so small," he says.

During those years, Dave was active in his church and had more friends through the church's youth group than in high school. Church left its mark and his faith remains a touchstone for Dave. "My wife and I have always tried to make that an important part of our life," he says.

A co-op student at Caterpillar

Dave's initiation into the world of work made a mark, too. He lasted just long enough on his first job to know he wanted to do something else. "I wasn't even 16 and I got a job going door to door trying to arrange appointments for a salesman to come by and sell home siding. I hated it; hated that sales stuff. Hated it so much I quit after one day."

He had better luck on a subsequent job. During college at Kansas State he was a co-op student employee with Caterpillar Inc., spending every other semester and summer moving between Kansas State in Manhattan, Kansas, and Peoria, Illinois, Caterpillar's corporate headquarters, doing different jobs. His first job for the heavy equipment giant was working on the manufacturing line, for which he had to join the United Auto Workers union.

"During my first week there they had a wildcat strike. As a new hire, I was on probation — I had to either show up to work or I was going to be fired. Well, I couldn't afford to be fired so I had to figure out how to get across this UAW picket line. Fortunately, there were some leaders on the picket line who understood my predicament and let me through. All in all that was a great job. It allowed me to pay my way through school and it added meaning to the engineering curriculum."

A wise counselor intervenes

Dave excelled in engineering at college, but engineering wasn't his first choice of career. He still heard the call of the outdoors when he started thinking about his future. "If I'd had my druthers I'd have gone into forestry," he says, "but I had a wise counselor through our church group in high school and he sat me down and said, 'You know, there are 5,000 forestry graduates every year in the United States and there are 100 jobs.' That's when I decided to go into engineering."

If that decision was a pivotal point in his life, it was nothing compared to a life decision that had its beginnings on the beach at Padre Island during a spring break from school. That's where he met his future wife.



GONE FISHIN' — Dave Douglass and his grandchildren try their luck from the dock at Dave's home on Beaver Lake, Arkansas. "We go perch fishing off the dock virtually everytime they visit," Dave says. (Photo courtesy of Dave Douglass)

"We had mutual friends," Dave says. "It wasn't planned at all. We met on the beach. It was casual, almost just a passing hello." And that was that, or so it seemed.

"I think it was maybe a month or two later that Tammy called me. She was in a sorority and they were having their spring formal. She said, 'Hey, do you want to go?' so I thought, 'Why not, she's buying the dinner.' And after that, well, we saw a lot of each other and we were married a year later." They've been married 36 years now.

Dave says the day he was married was the happiest day of his life, along with the births of his three sons and his grandchildren.

"Those memories stick in my mind. And being there

(Continued on page 7)